

## The *Elachista juliensis* complex revisited (Elachistidae)

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**Abstract.** The taxonomy of the *Elachista juliensis* complex is revised on the basis of extensive samples, including ex ovo series. Four species are considered to be valid: 1. *Elachista juliensis* Frey, 1870, (= *E. freyi* Staudinger, 1870 **syn. rev.**, *E. klimeschi* (Traugott-Olsen, 1994) **syn. rev.**, *E. ingeborgae* (Traugott-Olsen, 1994) **syn. n.**), 2. *Elachista occidentalis* Frey, 1882 (= *E. buvati* (Traugott-Olsen, 1994) **syn. n.**, *E. ruthae* (Traugott-Olsen, 1994) **syn. n.**), 3. *Elachista zonulae* Sruoga, 1990, and 4. *Elachista ribentella* **sp. n.** *E. juliensis* is distributed in Central Europe and seems confined to *Carex humilis*. *E. occidentalis* is widespread throughout Europe. It feeds on *Carex digitata* and *C. ericetorum*. *E. zonulae* is recorded from the Alps, Tatra Mts., Tian Shan Mts. in Kazakhstan, Kyrgyzstan and Tajikistan, and Altai Mts. in Siberia. It has been reared from *Carex sempervirens*. *E. ribentella* is recorded from Japan and the Russian Far East. Its host plant is *Carex blepharicarpa*.

**Key words.** Elachistidae, Elachistinae, *Elachista*, taxonomy, synonymy, *Elachista ribentella*, new species, Palaearctic

### Introduction

The Elachistinae (Gelechioidea: Elachistidae) comprises numerous small-sized moths characterised by the leaf-mining larval mode of life. The adults are notoriously difficult to identify due to their generally uniform genital morphology. This, in addition to the scarcity of material available for many species, has led to uncertain species concepts based on vague character evidence. Numerous papers dealing with the taxonomy of European *Elachista* Treitschke, 1833 species have been published during the last decades. These papers are often dedicated to descriptions of single species, not always accompanied with adequate reference to other related or similar species. Many species complexes still await critical treatment with all constituent taxa simultaneously presented.

In this paper the species complex containing *Elachista juliensis* Frey, 1870 and its close allies is revised. These taxa are considered to belong to the genus *Elachista* following the generic revision by Kaila (1999). This complex has caused problems in identification for a long time. Spuler ([1903]–1910) confused the species *Elachista serricornis* Stainton, 1854 and *Elachista freyi* Staudinger, 1870. In subsequent literature the former species was often called *E. mitterbergeri* Rebel, 1906 and the latter *E. serricornis*. This error still persists in the literature as confusion of the host plant records of these taxa in Traugott-Olsen & Schmidt Nielsen (1977), repeated by Parenti and Varalda (1994), but see Buhl et al. (1991). Parenti (1977) designated the lectotypes of *Elachista juliensis* and *E. occidentalis* Frey, 1882 and considered them conspecific, but did not mention *E. freyi* in this context. Traugott-Olsen & Schmidt Nielsen (1977) designated the lectotype of *E. freyi*, without mention of *E. juliensis*. Sruoga (1992) described the closely related *E. zonulae* from mountains of Central Asia, and Kaila (1992) supplemented the description by describing the female of this species, based on one specimen in bad condition.

Traugott-Olsen (1994) attempted to clarify the situation where the identity and possible conspecificity of *E. juliensis*, *E. freyi*, and *E. occidentalis* had not been properly investigated. This paper is the most comprehensive treatment of this species complex. Unfortunately, its many errors and uncritical treatment of supposed differences between taxa weaken its usefulness. The identity of *E. juliensis*, i.e. the oldest name available in this complex, was not based on the lectotype and was misunderstood. Likewise, the illustrations representing *E. occidentalis* actually depict *E. juliensis*. The existence of *E. zonulae* (Sruoga, 1992) was overlooked although its male genitalia were illustrated in connection with the description of *Biselachista buvati* Traugott-Olsen, 1994 (cf. Liška 1998; Tokár et al. 1999; Baran 2003). Traugott-Olsen (1994) considered *E. juliensis*, *E. freyi*, and *E. occidentalis* to be valid species, and described four additional species as new in this complex. In the absence of identification keys or proper diagnoses the reader was left with few tools to identify any specimens of this complex. The problem is particularly severe because the suggested differences between the supposed species are tiny. In specific differences the emphasis was placed on wing venation characters for which the utility in species delimitation was found worthless by Albrecht & Kaila (1997), and genitalic characters such as the shape of the vinculum which seems to be one of the intraspecifically most variable and least reliable trait in the male genitalia of *Elachista*. The genital illustrations of Traugott-Olsen (1994) are not quite accurate either (some detailed discussion is given below): some genital illustrations were not drawn from primary types and in the case of *E. buvati* the male genitalia illustrations do not represent the same species as the description.

A closer scrutiny of the variation of the taxa involved suggests that the range of individual variation in populations easily exceeds the specific differences as suggested by Traugott-Olsen (1994). Thus, many, if not most specimens do not fit well any of these descriptions. There are extensive samples of this species complex in many collections that at present cannot be reliably identified, leading to haphazard distribution records based on educated guesses at best. Each specialist seems to have adopted a personal opinion about the validity and delimitation of the species which means that identifications made by different specialists are not fully comparable. It was therefore considered necessary to revise this complex again, but with an emphasis on the estimation of the nature and range of the intraspecific variation. For that purpose, we include photographic illustrations of the primary types involved and extensive samples from all over the Palaearctic region. The limits of species were established and the type specimens of each nominal species were examined in order to find the correct names for each valid species.

As a result, four species are considered to be valid. In Europe, three species occur: *Elachista juliensis*, *E. occidentalis*, and *E. zonulae*. The two first are somewhat variable and considered distinct on the basis of constant differences in the length of the labial palpus and in the shape of the female antrum, supplemented by other strongly correlated yet more variable characteristics: their forewing pattern, the size and differences in the colour of the head, and characteristics of the male genitalia, especially in the size and shape of the uncus. *E. zonulae* is more distinctive, always identifiable by

both external appearance and genitalia. The fourth species, *Elachista ribentella* sp. n., occurs in Japan and the Russian Far East. Its status as a distinct species is based on its thicker flagellum of the antenna, shorter aedeagus with longer cornutus than in other species, and slight differences in the external appearance.

**Material was received from the following collections:**

- BMNH The Natural History Museum, London, U.K. (K. R. Tuck),  
MNHB Museum für Naturkunde, Humboldt-Universität Berlin, Germany (W. Mey),  
SEHU Laboratory of Systematic Entomology, Faculty of Agriculture, Hokkaido University, Japan (K. Sugisima),  
TLMF Tiroler Landesmuseum Ferdinandeum, Innsbruck, Austria (P. Huemer),  
MZLU Museum of Zoology, Lund University, Sweden (R. Danielsson),  
MZH Zoological Museum, Finnish Museum of Natural History, University of Helsinki, Finland (L. Kaila),  
ZMUC Zoological Museum, University of Copenhagen, Denmark (O. Karsholt),  
ZSM Zoologische Staatssammlung, Munich, Germany (A. Seegerer),  
ZMUO Zoological Museum, University of Oulu, Finland (J. Itäemies),

and the private collections of G. Baldizzone (Asti, Italy), P. Grotenfelt (Kauniainen, Finland), J. Junnilainen (Vantaa, Finland), J. Kaitila (Vantaa, Finland), T. & K. Nupponen (Espoo, Finland), and P. G. Varalda (Morano, Italy).

In the material sections, rearing records by Varalda are indicated and refer to his rearing recording archive. The codes are indicated as, e.g. "rearing A.167".

**Diagnosis of the *Elachista juliensis* complex**

The members of the *Elachista juliensis* complex belong to the *E. tetragonella* (Herrich-Schäffer, 1855) group as defined by Kaila (1996 and 1999). Within the *E. tetragonella* group these species belong to a subgroup that is characterised by a bilobed mesal knob of the gnathos (= the genus *Biselachista* of Traugott-Olsen & Schmidt Nielsen, 1977). In this subgroup the representatives of the *E. juliensis* complex are not known to share any obvious synapomorphies, but they can be characterised by their dark grey to brown forewing ground colour lacking metallic sheen, combined with the non-serrate flagellum of the antenna, the slender shapes of the aedeagus and digitate process, the slightly longer than wide uncus lobes, and the cornutus of the aedeagus being a weak simple rod. Like most other species of the *E. tetragonella* group, the species of the *E. juliensis* complex feed on *Carex* (Cyperaceae). They seem to show high fidelity to certain *Carex* species, which may help in the field identification of the species.

**Identification of the species of the *Elachista juliensis* complex**

*Elachista juliensis*, *E. occidentalis*, and *E. ribentella* are all morphologically close to each other, while *E. zonulae* differs in several ways, bearing resemblance with *E. serricornis* with respect to some traits. *E. occidentalis* is the largest of the species and its wing pattern is characterised by a black oblique streak that basally delimits the white costal spot. This trait is especially distinctive in paler specimens; the ground colour of *E. occidentalis* varies from dark mottled grey to paler grey and brownish



(Fig. 10). Its labial palpi are longer than those of *E. juliensis*. *E. ribentella* externally resembles particularly mottled grey specimens of *E. occidentalis*, and they both also have a more or less white head. *E. ribentella* is slightly more broad-winged and the pale pattern of the male is indistinct, all spots being suffused by dark-tipped scales (Fig. 19). The flagellum of the male antenna is thicker and more clearly annulated in *E. ribentella* than in the other species. *E. juliensis* is smaller, its forewing ground colour always dark grey (Fig. 1). The colour of its head varies from unicolorous grey to white. The male genitalia of these three species closely resemble each other. *E. ribentella* differs from the other species by its shorter aedeagus and longer cornutus (compare Figs. 20–22). Its distal fold of the costa is also more pronounced, and usually distinctively broadened distally. The separation of *E. juliensis* from *E. occidentalis* using male genitalia is usually possible by the longer uncus lobes of *E. occidentalis*, and by its slightly more slender valva, digitate process, and aedeagus (cf. Figs. 4–8, 12–15). This difference seems not to be caused by allometry due to the generally larger size of *E. occidentalis*, as these characters do not display intraspecific trends that would correlate with their size. The female antrum is the most straightforward character to distinguish between *E. juliensis* and *E. occidentalis*: it is distinctly broader than deep in *E. juliensis* while it is as broad as deep in *E. occidentalis* (Fig. 18). The antrum shape of *E. ribentella* varies, but it seems to be more strongly armed with spines than in the other species. The shape of the signum is very variable and probably is of little use in identification of any of the species. However, it may be that the teeth are somewhat stouter in *E. occidentalis* than in *E. juliensis* (Fig. 17). *E. zonulae* is externally characterised by its invariably grey head and the costal and tornal spots of the forewing being situated opposite to each other, as in *E. humilis* Zeller, 1850 (Fig. 24). Its male genitalia are characterised by the narrow and long uncus lobes separated by a broad incision, the valva with the cucullus only weakly twisted on top of the costa, and the basally strongly bent aedeagus (Figs. 25, 26). The female genitalia differ from those of the other species by the smaller antrum (Fig. 18).

### *Elachista juliensis*

(Figs. 1–9, 17–18)

*Elachista juliensis* Frey, 1870: 279, nec Traugott-Olsen (1994)

*Elachista freyi* Staudinger, 1870: 322, **syn rev.**

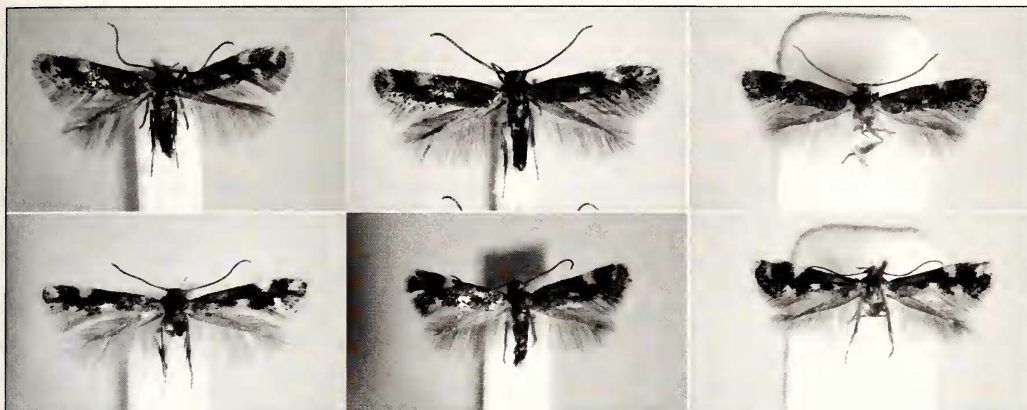
*Biselachista klimeschi* Traugott-Olsen, 1994: 326, nec Dufrane, 1957, **syn rev.**

*Biselachista ingeborgae* Traugott-Olsen, 1994: 332, **syn. n.**

*Biselachista occidentalis* sensu Traugott-Olsen, 1994, nec Frey, 1882 (partim)

**Material.** Lectotype ♂ of *Elachista juliensis*, labelled: LECTO- / TYPE [rounded with blue margin]; *E. juliensis*. / Frey / Engadin; Frey coll. / Brit. Mus. / 1890-62; B. M. ♂ / Genitalia slide / No. 1932; LectoTYPUS ♂ / *Elachista / juliensis* / Frey / TESTE U. PARENTI 1976. (BMNH). Lectotype of *Elachista freyi*, labelled: 29/7; Macugnago m.; Origin.; *freyi* Stdgr; Genital praeparat nr. 1984 sex ♂ *E. Traugott-Olsen*, LECTOTYPE; Zool. Mus. Berlin (MNHB). Paralectotype slides: ♀, U. Parenti 82, 9519 (MNHB); ♂, teste Hering No. 608/1941 (MNHB). Holotype of *Biselachista klimeschi*, labelled: Holotype; Genital praeparat nr. 6433 sex: ♂; *E. Traugott-Olsen*; Wing praeparat nr. 6434 sex: ♂ *E. Traugott-Olsen*; Carinthia, H. Blut Tauernbg. 1800 m 14.8.1973 Klimesch; *Biselachista klimeschi* sp. n. det. *E. Traugott-Olsen*; coll. *E. Traugott-Olsen*; coll. ZMUC Copenhagen Denmark. Paratypes 2♂ with the same collection data (1♂ in ZMUC, 1♂ in ZSM with slide LK 3744). Type series of *Biselachista ingeborgae* (see remarks below): 1) pin with holotype label, with two male specimens of which one lacks right wing pair and the other is without abdomen, labelled: Holotype; Genital praeparat r. 6438 sex ♂ *E. Traugott-Olsen*; Wing praeparat nr. 6439 sex ♂ *E. Traugott-Olsen*; Trentino Val Sarca Pietramurata,



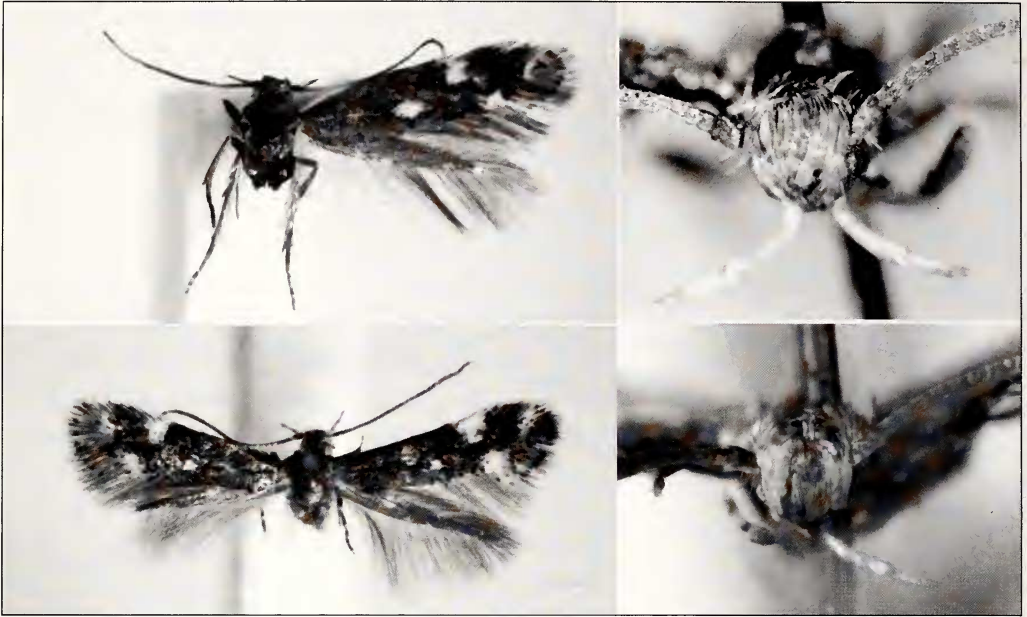


**Fig. 1.** Habitus of *Elachista juliensis*. Top row: males, bottom row females. Top left: Austria, Carinthia, Rossbach, Hl. Blut, 1700 m, 10.viii.1969, Klimesch leg. (ZSM). Top middle: Austria superior, Warscheneck, 1700 m, 8.viii.1937, Klimesch leg. (ZSM). Top right: Italy, V. d'Aosta, Aymavilles, frazione Ozein, 1250 m, ex ovo A. 131 1993, Varalda leg. et coll.. Bottom left: Austria, Carinthia Hl. Blut Tauernbg., 1800 m, 16.viii.1974, Klimesch leg. (ZSM). Bottom middle: Austria, Wien, Leopoldsberg, 5.vii.1942, Preissecker leg. (ZSM). Bottom right: Italy, Piemonte, Chiusa San Michele (TO), Sacra S. Mich., 850 m, ex ovo A. 193 1994, Varalda leg. et coll.



**Fig. 2.** Habitus and head of the primary types of taxa here considered conspecific with *Elachista juliensis*. Top: lectotype of *Elachista juliensis*. Bottom: lectotype of *Elachista freyi*.

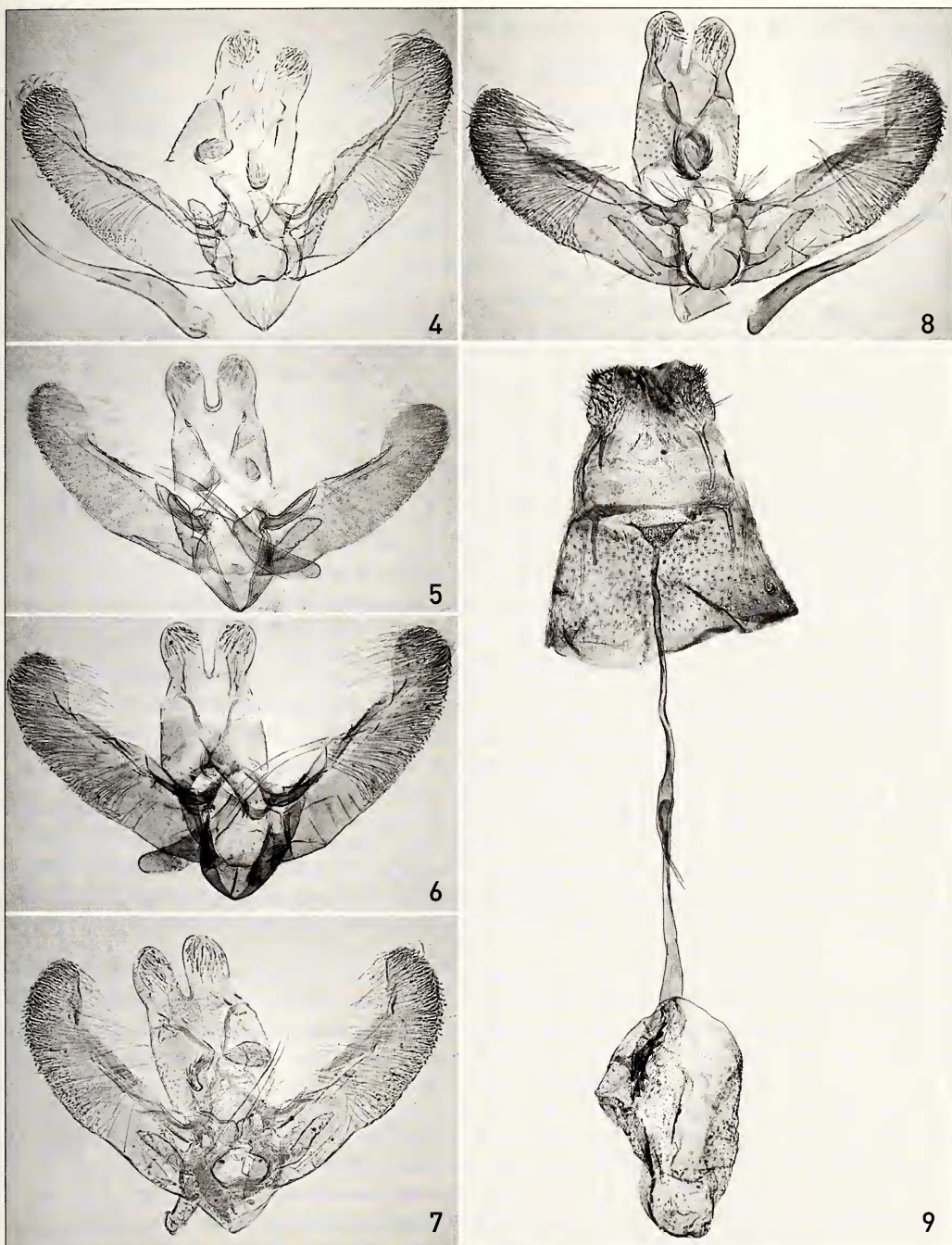
m 250, nei boschi 28.vi.59 E. Jäckh; *Biselachista ingeae* sp. n. det. E. Traugott-Olsen; *Biselachista ingeborgae* sp. n. det. E. Traugott-Olsen; coll. E. Traugott-Olsen; coll. ZMUC Copenhagen Denmark. 2) pin with paratype label containing two male specimens, one without abdomen, with preparation label 'Genital praeparat nr. 6446 sex: ♂; E. Traugott-Olsen'; otherwise with the same labeling as the holotype pin. **Austria:** 1♂ Austria inf., Dürnstein, 14.vii.1938, Klimesch leg. [in a pin together with a ♀ *Elachista*



**Fig. 3.** Habitus and head of the primary types of taxa here considered synonyms of *Elachista juliensis* Frey. Top: holotype of *Biselachista klimeschi*. Bottom: holotype of *Biselachista ingeborgae*.

*martinii* Her.] (LK slide 3772 *juliensis*, 3773 *martinii*, ZSM). 1♀ same data, but 18.vi.1938 (e. l. ex *Carex humilis*), Klimesch leg., with identification label “*Biselachista occidentalis* Frey det. E. Traugott-Olsen”, Akvarel E. Traugott-Olsen (ETO slide 1782, ZMUC). 3♂ Austria superior, Klaus, 4.viii.1937, 19.vi.1946, Klimesch leg. (slide IS 4235) (MZLU). 1♂ Austria superior, Hinterstoder, 14.vii.1938, Klimesch leg. (LK slide 3774, ZSM). 2♂ Austria superior, Warscheneck, 1700 m, 8.viii.1937, [collector not mentioned] (ZSM). 2♂ Carinthia, H. Blut Tauernbg., 1800 m, 16.8.1974, Klimesch leg. (ETO slide 6536, ZMUC, 1♂ in ZSM); 5♂ same data, but 13.–14.viii.1973 (LK slides 3190, 3734, 3735, MZH). 1♂ Carinthia, Rossbach Hl. Blut., 1700 m, 10.viii.1969, Klimesch leg. (ZSM). 2♂ Teriolis sept. Innsbruck 18.vii.1941, 19.vii.1942, Klimesch leg. (TLMF). 2♂ Teriolis, Brenner Vennatal, 1400 m, 27.vii.1947, Klimesch leg. (ZSM). 1♀ Wien, Leopoldsberg 5.vii.1942 (e. l. ex *Carex* sp.), Preissecker leg. (ZSM). **Germany:** 1♂ Thuringia, Blankenburg, 21.vii.1970, Steuer leg., with identification label “*Biselachista occidentalis* Frey det. E. Traugott-Olsen” (LK slide 3771, ZSM). 1♂, 1♀ Blankenburg, Muschelkalk, 4.viii.1968 (ETO slide ♀ 5201, LK slide ♂ 3739); 1♀, same data, but 2.vii.1978 (e. l. ex *Carex humilis*), Steuer leg. (ZMUC); 1♂, same data, but 26.vii.1978 (e. l. ex *Carex humilis*) with identification label “*Biselachista occidentalis* Frey det. E. Traugott-Olsen” (ZSM). 2♂ Regensburg, 17.vii.1899, 19.vii.1900 (ex *Carex humilis*), coll. Frank, coll. Osthelder, with identification label “*Elachista juliensis* det. Kolbeck” (LK slide 3737, Kolbeck slide 18671/96, ZSM). **Italy:** 1♂, 1♀ Italy, Piemonte, Chiusa San Michele (TO), Sacra S. Mich., 850 m, rearing A.167, 5.–10.vii.1994 (ex *Carex humilis*); 13♂ 14♀, same data, but rearing A. 168, 18.vi.–10.vii.1994 (ex *Carex humilis*), Varalda leg. et coll. (slides LK 3847–3856, 3881–3890); 6♂ 3♀ rearing A. 193, 12.vi.–5.vii.1994 (ex *Carex humilis*), Varalda leg. et coll. (slide Varalda 0164). 1♂ 1♀ Piemonte, Ovada (Alessandria), per Gnocchetto, 260 m, rearing A. 152, 3.–13.vii.1994 (ex *Carex humilis*), Varalda leg. et coll. 1♂ Piemonte, Mt. Rocciamelone (TO) Mompantero-Riposa, 1100 m, rearing A. 138, 3.vii.1993 (ex *Carex humilis*), Varalda leg. et coll. 5♂, Piemonte (CN) Parco Natur. Reg. Alpi Maritime, Valdieri, Riserva Natur. Speciale dello *Juniperus phoenicea*, 900 m, 18., 22.vii.1998, Baldizzone leg., with identification label “*Biselachista freyi* Stgr. det. E. Traugott-Olsen”, (ETO slide 6597, LK slide 3736, ZMUC); 8♂ 3♀ 17.vii.1999, 17., 20., 14.–27.vii.2000, Baldizzone leg., all with identification label “*Biselachista juliensis* P. G. Varalda det.” (coll. Baldizzone); 43, 7♀ same data, but 13., 18., 22.vii.1998, 11.vi., 10.vii., 12., 17.vii.1999, Baldizzone leg., all with identification label “*Biselachista freyi* Stgr. det. E. Traugott-Olsen” (coll. Baldizzone). 16♂ Piemonte (CN) Parco Natur. Reg. Alpi Maritime, Palanfré – loc. Pascariund, 1450 m, 5.viii.2001,





**Figs. 4–8.** ♂ genitalia of *Elachista juliensis*. **4.** *E. juliensis*, lectotype (BM 19382, BMNH). **5.** Lectotype of *E. freyi* (ETO 1984, MNHB). **6.** Holotype of *Biselachista klimeschi* (ETO B.6.4.93, ZMUC). **7.** Holotype of *Biselachista ingeborgae* (ETO A.10.4.93, ZMUC). **8.** *E. juliensis* from Italy, Piemonte (LK 3851). **9.** ♀ genitalia of *E. juliensis* from Italy, Piemonte, Chiusa San Michele (TO), Sacra S. Mich., 850 m (LK 3882).



Baldizzone leg. et coll. 1♂ Piemonte (CN) Parco Natur. Reg. Alpi Maritime, Monte Ray, 1600–1800 m, 31.vii.2001, Baldizzone leg. et coll. 1♂ Piemonte, Parco Naz. Gr. Paradiso loc. Lago Serrù, 2275 m, 6.viii.1992, Delmastro leg., with identification label "*Biselachista klimeschi* Tr.-O. det. E. Traugott-Olsen" (ETO slide 6536, ZMUC). 1♂ Trentino, Val Sarca colline Lago di Cavedine, 7.viii.1970, Jäckh leg. (ZMUC). 1♂ Trento, 28.vi.1945, Klimesch leg. (LK slide 3191, MZH). 2♂, 3♀ Dintorni Trento 28.vi.1945, vii.1945, Klimesch leg. (MZH, LK slides 3767–3770, ZSM). 4♂ 4♀ V. d'Aosta, Aymavilles (Aosta), frazione Ozein, 1250 m, rearing A. 131, 18.vi.–9.vii.1994 (ex *Carex humilis*), Varalda leg. et coll. (slide Varalda 0162); 1♀ same data, but rearing A. 253, 16.vii.1995 (ex *Carex humilis*), Varalda leg. et coll. 7♂, 10♀ Aymavilles (Aosta), frazione Pondel, 890 m, rearing A. 250, 14.vi.–20.vii.1995 (ex *Carex humilis*), Varalda leg. et coll.

**Description.** Forewing length ♂ 2.6–3.3 mm, ♀ 2.5–3.0 mm. Male: Labial palpus ascending, length 1.0–1.2 times diameter of head; above white or pale ochreous except base of 3rd segment narrowly grey, below variably powdered with grey. Head varying: frons may be partly or entirely shiny white, head otherwise grey, or whole head unicolorous grey or mottled grey. Neck tuft mottled grey. Thorax mottled grey, scales of tegula and metascutum sometimes whitish, grey-tipped. Forewing ground colour dark grey, with five white markings for which size and brightness vary:

1 – indistinct small white streak basally, often absent, 2 – another more distinct streak distally from black streak situated at fold before middle of wing, 3 – triangular costal spot at distal 2/3 of costa, 4 – small, more or less rounded tornal spot beyond costal spot, and 5 – transverse streak at apex. Fringe scales grey, basal fringe scales black-tipped forming black fringe line. Hindwing grey. Underside of forewing dark grey, fringe at costal and tornal spots creamy white; underside of hindwing grey. Female otherwise as male but forewing with brighter and more expanded white pattern.

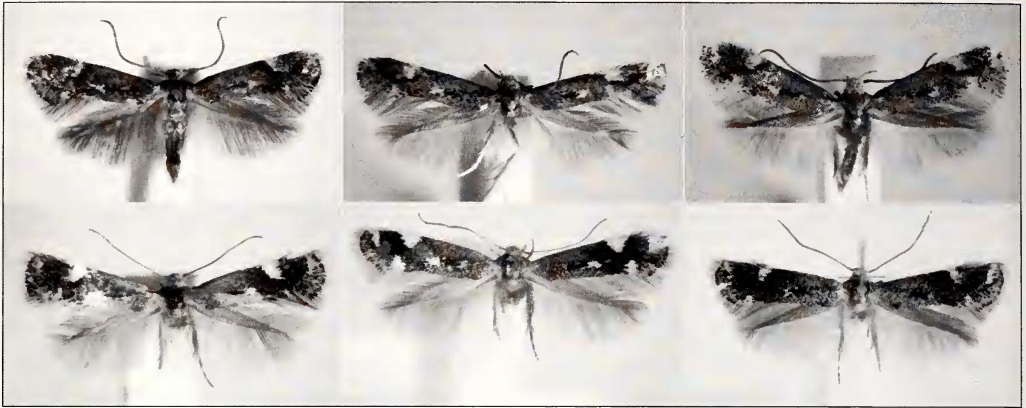
**Male genitalia.** Uncus lobes slightly longer than broad, distally rounded; median incision between them narrow u-shaped. Mesal margin of juxta lobes short, straight, distal margin almost straight, medially with group of long scales; digitate process rather narrow, distally variably oblique and acute-tipped or blunt, tongue-shaped; 0.28–0.30 times as long as valva; valva somewhat bent, width 0.3 times length at widest point; basal and distal fold of costa meet at 1/3 length of valva, distal fold even, sometimes slightly wrinkled; length of cucullus 1/4 of valva, longer than wide, somewhat bent towards costa, distinctly twisted over distal fold of costa. Aedeagus gradually tapered towards apex, 0.80–0.95 times as long as valva, slightly bent S-shaped, caecum as long as basal opening of aedeagus; vesica with indistinctly sclerotised straight narrow cornutus, 0.22–0.24 times as long as aedeagus.

**Female genitalia.** Papillae anales rounded, covered with long and thin setae, distally also with short and stout setae. Apophyses posteriores stout, rather straight, variable in length to some extent. Apophyses anteriores varying from 2/3 to full length of apophyses posteriores, stout or slender. Ostium bursae occupying half the width between apophyses anteriores, dorsal wall spinose; antrum broader than deep, internally spinose; ductus bursae posteriorly narrow, tubular, broader cephalad from inception point of ductus seminalis; sclerotisation of colliculum long, almost extended from antrum to inception of ductus seminalis; ductus bursae distinct from corpus bursae; corpus bursae largely covered with distinctive internal spines; signum an elongate dentate plate of variable shape.

**Life history.** *E. juliensis* is univoltine. It seems to be monophagous on *Carex humilis*. The full-grown larva is 4.5–5.0 mm long, faded wax-coloured, with the prothoracic and anal plates almost concolorous with the body with the exception of the distal area of the tergal prothoracic plate which is striking as being melanised. The mine occupies the median part of the leaf; it is thin, 1.0–1.5 mm wide and about 8.5–10.5 cm long. The initial mine, constituting about half the total length of the mine, is very thin and then gradually widens. Towards the end it occupies about half the width of the leaf. Pupation takes place on the base of the leaf in the densely caespitose tussock of the host plant. The pupa is ochreous.

**Distribution.** Central Europe. Material studied from Austria, Germany, and Italy.

**Remarks.** According to the original description (Traugott-Olsen 1994) the type series of *Biselachista ingeborgae* consists of the male holotype and three male paratypes, all in the E. Traugott-Olsen collection (ETO). The types are stated to be as follows (loc. cit., verbatim): “Holotype male: Italia, Trentino, Val Sacra, Pietramurata, 28-vi-59, leg. E. Jäckh; gen-prep. 6438/ETO; wing prep. 6439/ETO; *Biselachista ingeborgae* sp. n. det. E. Traugott-Olsen. In coll. ETO.. Paratypes: 1) on pin with type, abdomen missing. 2) and 3) on joint pin, same data as type, anterior specimen with gen. prep 6440/ETO. In coll. ETO.” In the Traugott-Olsen collection (now in ZMUC) there are four specimens labelled as type material. However, they do not fit the characteristics cited above. On the pin with the holotype label and the preparate labels, containing two specimens, one of the specimens lacks the abdomen and the other a pair of wings. Thus, the genital dissection and the wing preparation were made from different specimens. The slides corresponding to these numbers were not found in the ETO collection. There are, instead, a genital dissection numbered A.10.4.93 and a wing preparation numbered B 4.4.93. The paratype dissection no. 6440 has not been located. Ole Karsholt (pers. comm.) informed us that Traugott-Olsen changed his slide numbering system, but that this change had not been executed consistently. Therefore the existing wing slide almost certainly is the same as mentioned by Traugott-Olsen (1994), and the genital slide is either the holotype or the paratype slide. The male genital drawing of *B. ingeborgae* (Figs. 29, 37 in Traugott-Olsen 1994) generally resembles the genitalia on slide A.10.4.93 (cf. Fig. 7) although the digitate process is more compressed on the slide than on the drawing, and unlike the drawing, the tip of the aedeagus is not bifurcate on the slide. However, the general position of the genitalia drawing, agrees well with the genitalia on the slide. Similar discrepancies can be seen when the authentic genital slide of *Biselachista ruthae* Traugott-Olsen, 1994 (Fig. 13) is compared with Traugott-Olsen’s drawing (1994: figs. 27, 35). In this case the digitate processes are drawn narrower and more three-dimensional than on the slide. This allowed the reconstruction of the natural shape of the digitate process which is now distorted on the preparation. Based on this evidence, we suggest that the slide A.10.4.93 of *B. ingeborgae* is the one mentioned as 6438/ETO in the original description. We further suggest that the specimen lacking the abdomen on the pin with the holotype label is indeed the holotype of *Biselachista ingeborgae*.



**Fig. 10.** Habitus of *Elachista occidentalis*. Top row: males, bottom row females. Top left: Austria superior, Umg. v. Linz, 18.vii.1937, Klimesch leg. (ZSM). Top middle: Italy, Piemonte, Parco Natur. Reg. Alpi Maritime 26.vii.1997, Baldizzone leg. (coll. Traugott-Olsen, ZMUC). Top right: Sweden, Sm. Marbäck 19.vii.1966, Svensson leg. (MZLU). Bottom left: Austria, Carinthia Hl. Blut Tauernbg., 1800 m, 18.viii.1974, Klimesch leg. (ZSM). Bottom middle: Finland, Oba: Utajärvi, e. l. 2003 (ex *Carex ericetorum*), Itämies leg. (ZMUO); Bottom right: Poland DV 57, 700 m, Pieniny Mts., Trzy Korony e. l. 2003 (ex *Carex digitata*), Baran leg. et coll.

### *Elachista occidentalis* Frey

(Figs. 10–18)

*Elachista occidentalis* Frey 1882: 372

*Biselachista buvati* Traugott-Olsen, 1994: 327, **syn. n**

*Biselachista ruthae* Traugott-Olsen, 1994: 330, **syn. n**.

*Biselachista freyi* sensu Traugott-Olsen & Nielsen 1977, nec Staudinger, 1870

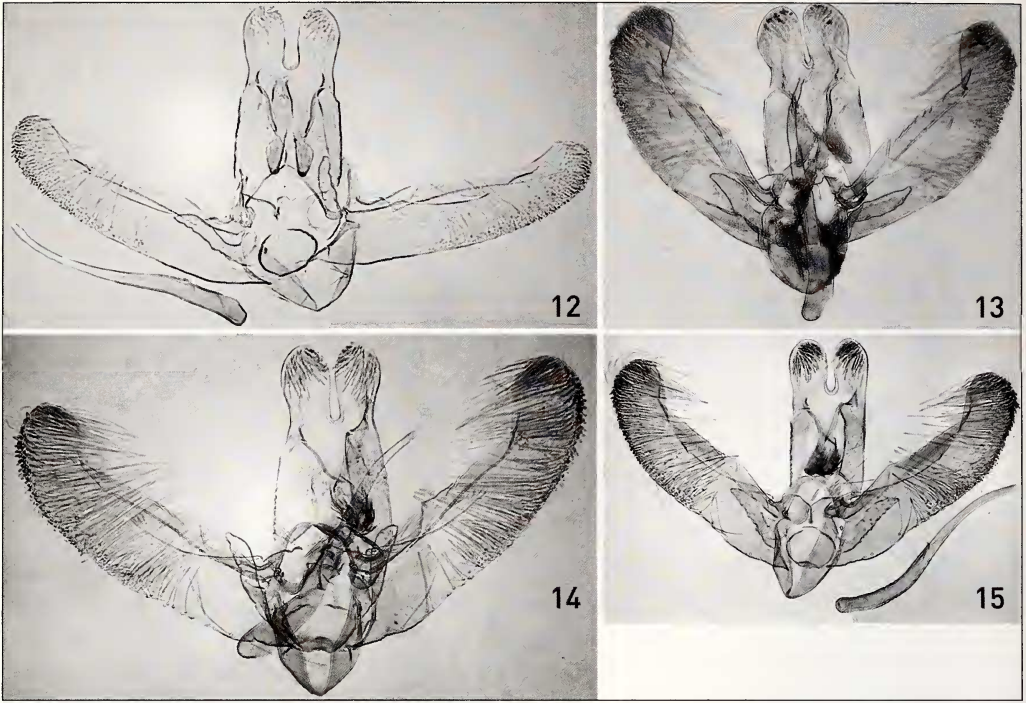
**Material.** Lectotype ♂ of *Elachista occidentalis*: LECTO- / TYPE [rounded with blue margin]; *E. occidentalis*. / Frey / Crassier (Loriol.); Frey coll. / Brit. Mus. /1890-62; B. M. ♂ / Genitalia slide / No. 19383; LectoTYPUS ♂ / *Elachista occidentalis* Frey / TESTE U. PARENTI 1976. There is also another specimen, labelled as a paralectotype of *Elachista herrichii* Frey, B. M. slide 19377, *Elachista occidentalis* Frey L. Kaila det. 2000. (Frey coll., no further data, BMNH). Holotype of *Biselachista buvati*, labelled: Holotype; Genital praeparat nr. 5879 sex: ♂; E. Traugott-Olsen; Wing praeparat nr. 6426 sex: ♂ E. Traugott-Olsen; Italia - Piemonte Val Curone (Prov. AL) Poggio di Casasco 9.vi.1983 G. Baldizzone legit; *Biselachista buvati* sp. n. det. E. Traugott-Olsen; coll. E. Traugott-Olsen; coll. ZMUC Copenhagen Denmark. Holotype of *Biselachista ruthae*, labelled: Type; Teriolis mer.; Kreuzb. P. Sexten 1600 m 21.7.1986 J. Klimesch; Genital praeparat nr. B.5.4.93 sex: ♂; E. Traugott-Olsen; Wing praeparat nr. A.6.4.93 sex: ♂ E. Traugott-Olsen; coll. E. Traugott-Olsen; coll. ZMUC Copenhagen Denmark; Holotype *Biselachista ruthae* Traugott-Olsen. Paratypes of *Biselachista ruthae*: 2♂ 2♀, with the same collection data as in the holotype (2♂ 1♀ in ZMUC, ♀ with slides E. Traugott-Olsen B.10.4.93 (genitalia), A.15.4.93 (wings)), 1♂ LK slide 3745, ZSM). **Austria**: 1♂ Austria superior, Klaus, 4.vii.1937, Klimesch leg. (MZLU). 1♂ Umgeb. v. Linz 18.vii.1937, Klimesch leg. (ZSM). 2♂ Carinthia, Rossbach Hl. Blut, 1700 m, 10.viii.1968, 13.viii.1974, Klimesch leg. (TLMF). 4♂ Carinthia, Hl. Blut Tauernbg. 1800 m, 13.–14.viii.1974, Klimesch leg. (slides 3740, IS 6469) (ZSM, MZLU). 2♂ Carinthia, Hl. Blut Tauernbg. A 1700 m, 13.viii.1974, Klimesch leg., with identification label "*Biselachista juliensis* Frey det. E. Traugott-Olsen" (ETO slide 6435, ZMUC, LK slide 3738, ZSM). 1♀ Carinthia, Hl. Blut Tauernbg., 1800 m, 13.viii.1974, Klimesch leg. (ZSM). 1♂ Liesing, 1.viii.1919, 'freyi' det. E. Jäckh. (ZMUC). 1♂ Osttirol, Virgental, Venedigergruppe, Timmeltal, 2100–2300 m, 1.viii.1993, Ryrholm leg. (TLMF). 3♂, 1♀ Osttirol, Virgental, Venedigergruppe, Sajatmähder E. 2300–2500 m, 12.viii.1993, Ryrholm leg. with identification label "*Biselachista juliensis* Frey det. U. Parenti" (slides U. Parenti 12231, 12519, 12520, 12522, TLMF). 4♂ N. Tirol, Glocknergruppe, Loweraze, 1660–1860 m, 30.–31.vii.1991, Karsholt, Rakosy & Tarmann leg. (slides LK 684, 688, 3192) (ZMUC). 2♂ N. Tirol, Glocknergruppe, above Kals, 1700–2200 m, 29.vii.1991, Karsholt & Rakosy leg. (slide LK 683) (ZMUC). 2♂, 1♀ N. Tirol, Glocknergruppe, Burg bei Kals, 1500 m, 28.–29.vii.1991, Karsholt & Rakosy leg. (ZMUC). 1♂, 1♀ Schnönau a.d. Enns O.Ö. 12.vii.1994, Wimmer leg. (TLMF). 1♂, 1♀ Windischgarsten, O.Ö., Veichlthal, 4.vii.1994, Wimmer leg. (TLMF). 1♂ Wien, Haschberg, 10.vi.1917,





**Fig. 11.** Habitus and head of the primary types of *Elachista occidentalis* and taxa here considered its junior synonyms. Top: lectotype of *E. occidentalis*, middle: holotype of *Biselachista ruthae*, bottom: holotype of *Biselachista buvati*.

Preissecker leg., '*serricornis*' det. E. Jäckh (ZMUC). **Bulgaria:** 1♂ Asenograd, 20.vi.2000, Junnilainen leg. et coll. (LK slide 3194). 1♀ Pirin, Popovi Livadi, 1300 m, 21.–24.vi.2001, Junnilainen leg. et coll. **Croatia:** 3♂ Plitvice, 17.–20.vii.1984, Schnack leg. (LK slides 3197, 3553, ZMUC). **Estonia:** 2♂ Pidula, 4.vii.1994, Junnilainen leg. et coll. 1♀ Kogula, 20.vi.1994, Junnilainen leg. et coll. **Finland:** *Ab.* 21♂, 9♀ Lohja, 1.viii.1961, 22.vii.1965, 20., 25.vii., 17.viii.1966, 26.vii.1967, 30.vii.1968, 26.vii., 1.viii.1969, 18., 23.vii., 15.viii.1970, 26., 27., 28.vii.1971, 18.vii.1972, 17.vii.1973, 20.vii.1975, 29.vii.1983, 25.vii., 8.viii.1987, 28.vii.1991, Krogerus leg. (slides LK 3731, 3732) (MZH); 1♂ same data, but 1990 (e.l.), Junnilainen leg. (MZH). 1♂ Lohja, Torhola 1993 (e. l. ex *Carex digitata*), Kaila leg. (MZH). *N.* 14♂ 10♀ Siuntio, Andby 668:35, 1991 (e. l. ex *Carex digitata*), Kaila leg. (slides LK 530, 681, 682, 685, 686, 3198, 3199, 3733, 3760–3763) (MZH), 2♂ same data, but 1991, Kaitila leg. (MZH). *St.* 1♂ Säskylä, 27.vii.2003, Kaitila leg. (slide LK 3756) (coll. J.-P.Kaitila). *Ta.* 1♂ Hattula, 28.vi.1936, Lindberg leg. (MZH). 9♂ same data, but Hattula 8.–10.vii.1936, Karvonen leg. (slide LK 687) (MZH). *Sa.* 1♂ Imatra, 12.vii.1955, Nybom leg. (MZH). *Ok.* 1♂ Kuhmo, 9.vii.1980, Nybom leg. (MZH). *Ob.* 2♂ 2♀ Utajärvi 716:47, 24.vii.1976, Kyrki leg. (slides J. Kyrki 1066, 1067) (ZMUO); 3♂ 2♀ (e l.), same data, but larvae 7.v.2003 (in *Carex ericetorum*), Itämies & Leinonen leg. (ZMUO). **France:** 1♂ Hautes Alpes RN 05, Les Vigneaux, 1000 m, 5.vii.2002, Junnilainen leg. et coll. (LK slide 3757); 3♂ 5 km W les Vigneaux, 1250 m, 5.–6.vi.2003, Junnilainen leg. et coll. (LK slide 3759). 1♂ Provence, 2 km N. la



**Figs. 12–15.** ♂ genitalia of *Elachista occidentalis*. **12.** *E. occidentalis*, lectotype (BM 19383, BMNH). **13.** Holotype of *Biselachista ruthae* (ETO A.3.4.93, ZMUC). **14.** Holotype of *Biselachista buvati* (ETO 5879, ZMUC). **15.** *E. occidentalis* from Finland (LK 3772).

Mur, 17.v.2003, Hendriksen leg. (ZMUC). **Germany:** 4♂ Baden, Grenzacherhorn, Paravicini coll. B. M. 1937–383 (BMNH). 1♂ (abdomen missing) '*E. serricornis* (Sta vid.) Sta Baden Baden, Frey coll., Brit Mus. 1890–62 (BMNH). 1♂, 1♀ [no locality given] Frey coll., Brit. Mus. 1890–62 (BMNH). 1♂ Regensburg, 15.vi.1932 (e. l. ex *Carex silv.*). Sälzl. leg., (LK slide 3743, ZSM). **Greece:** 1♂ Peloponés, Taygetos, vi.1996, Lastuvka leg. (LK slide 3552) (ZMUC). 2♂ Pindos, Konitsa, Pades, 6.vii.1981, Grotenfelt leg. et coll. (LK slides 3549, 3551). **Italy:** 4♂, 1♀ Friuli, Fiume Felia nr. Carnia, 240 m, 26.vi–2.vii.2003, Skule & Hviid leg. (ZMUC). 8♂ Piemonte (CN) Parco Natur. Reg. Alpi Maritime, S. Giacomo di Entracqa sopra Lago della Rovina, 1800–2000 m, 20., 26.vii.1997, and 1♂ same data, but 1550–1850 m, 20.vii.1997, all Baldizzone leg., and with identification label "*Biselachista ingeborgae* Tr.-O. det. E. Traugott-Olsen (coll. Baldizzone, ZMUC, LK slide 3862). 1♂ Piemonte (CN) Parco Natur. Reg. Alpi Maritime, Trinità (Entracque), Vallone Grande, 1400 m, 16.vii.1996, Baldizzone leg., with identification label "*Biselachista ingeborgae* Tr.-O. det. E. Traugott-Olsen (coll. Baldizzone). 1♂ Prov. Trento, Lago di Molveno, 10.vii.1983, De Prins leg. (LK slide 3741) (ZSM). 2♂ Südtirol, Montiggl Kl. Priol, 600 m, 26.vi.1993, 14.vii.1993, Huemer leg. (TLMF). 1♂ Südtirol, 400 m, Pfatten, Mitterberg, NO-Hang, 12.vii.1991, Huemer leg., with identification label "*Biselachista juliensis* Frey det. U. Parenti" (slide U. Parenti 12516) (TLMF). 1♂, 1♀ Teriolis mer., Kreuzberg Pass, 1600 m, 22.vii.1988, Klimesch leg. (♂ in ZSM, ♀ in MZH). 2♂ Kreuzberg, P. Sexten, 1660 m, 21.vii.1986, Klimesch leg., one specimen with identification label "*Biselachista juliensis* Frey det. E. Traugott-Olsen" (slide ETO 6437, ZMUC). **Poland:** Glinki n. Torún e. l. 23.v.1997 1♂, 14.v.1999 1♂, 31.v.2003 1♀ ex *Carex ericetorum*, all T. Baran leg. (LK slides 3746, 3860, 3864, MZH). 1♂, 1♀ Pieniny Mts. Trzy Korony, 700 m, 12., 15.vi.2003 (e. l., ex *Carex digitata*), Baran leg. (LK slides 3861, 3863, MZH). **Sweden:** *Gil.* Fleringe 14.vii.1969 1♂ I. Svensson leg. (MZLU). 1♀ Frijel, 16.vii.1977, Svensson leg. (slide IS 5873) (MZLU). 1♀ Lojsta, 18.vii.1965, Svensson leg. (slide IS 4641) (MZLU). 1♀ Rute, 7.vii.1984, Svensson leg. (slide IS 6804) (MZLU). 1♂ Tingstide, 4.vii.1969, Svensson leg. (slide IS 4788) (MZLU). 1♂ Vamlingbo, 16.vii.1959, Ekström leg.; 1♂ same data, but 14.vii.1977, Svensson leg. (MZLU). 1♀ Öja, 21.vii.1933, Benander leg. (MZH). *Sm.* 1♂ Högsby 13.–14.vii.1968, Svensson leg. (MZLU). 6♂, 1♀ Marbäck, 19.vii.1966, Svensson leg. (slide IS 4651) (MZLU). *Vg.* 2♂ Kinnekulle, 1.–2.vii.1966, 16.vi.1968, Svensson leg. (slide 4128) (MZLU). 2♂ Österplana 19.vii.1962, Svensson leg. (MZLU). *Öl.* 7♂ Gårdby, 4.vii.1989, 13.vii.1985, Svensson leg. (MZLU). 1♂ Hulterstad, 25.vi.1973, Svensson leg. (MZLU). 3♂



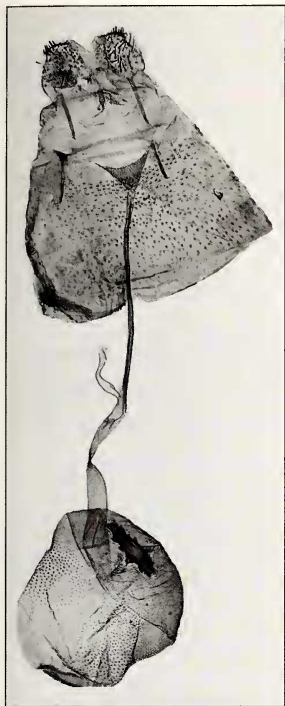


Fig. 16. ♀ genitalia of *E. occidentalis* from Finland, Siuntio (LK 3199).

Karums alvar, 23.vi.1959, Svensson leg. (slide IS 3100) (MZLU). 1♂ Kårehamn 23.vi.1973, Svensson leg. (MZLU). 1♂ Vickleby 13.–15.vii.1961, Svensson leg. (MZLU). Ög. 1♂ Kolmården, 23.vii.1975, Svensson leg. (slide IS 5644) (MZLU). **Switzerland:** 1♂ Baselland, Hardwald, Paravicini coll. B. M. 1937–383 (BMNH). – uncertain locality: 1♂, 2♀ [no locality given] Stainton coll. Brit. Mus. 1893–134 (BMNH).

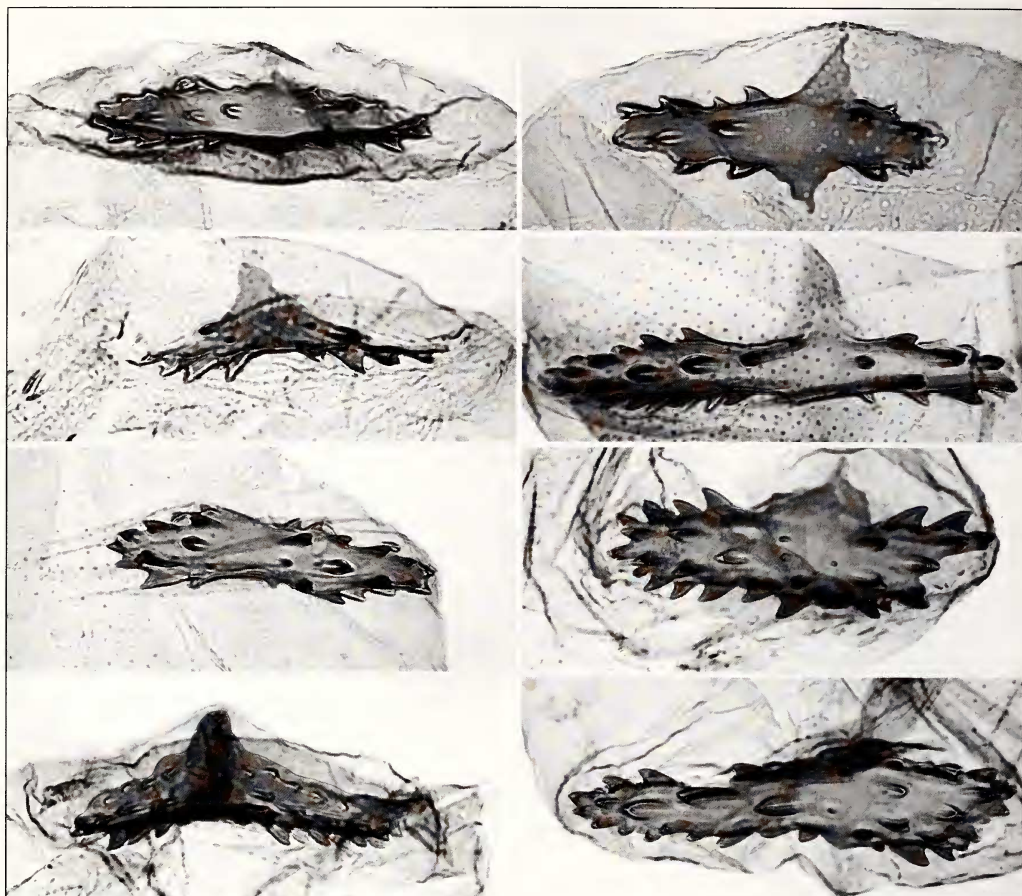
**Description.** Forewing length ♂ 3.2–4.5 mm, ♀ 3.1–4.3 mm. Male: Labial palpus ascending, length 1.4–1.5 times diameter of head; above white except base of 3rd segment narrowly grey, below variably powdered with grey in middle of 2nd and 3rd segments. Head shiny white, variably mottled with grey-tipped scales above and sometimes laterally. Neck tuft usually mottled grey, sometimes almost entirely white. Thorax grey, scales of tegula and metascutum whitish, grey-tipped. Forewing ground colour varying from grey to dark grey or brownish, with five white markings which vary in size and brightness: 1 – indistinct small white streak basally, 2 – another more distinct streak distally from black streak situated at fold before middle of wing, 3 – triangular costal spot at distal 2/3 of costa, 4 – small more or less rounded ternal spot beyond costal spot, and 5 – transverse streak at apex; costal spot basally delimited with oblique straight black streak. Fringe scales grey, basal fringe scales black-tipped forming black fringe line. Hindwing grey. Underside

of fore-wing dark grey, fringe at costal and ternal spots creamy white; underside of hindwing grey. Female as male but forewing ground colour dark grey with brighter and more expanded white pattern.

**Male genitalia.** Uncus lobes about 1.3 times longer than broad, distally rounded; median incision between them narrow, u-shaped. Mesal margin of juxta lobes short, straight; distal margin somewhat rounded, medially with a group of long scales; digitate process rather narrow, distally variable, oblique and acute-tipped; length 0.28–0.3 times length of valva; valva somewhat bent, width strongly variable, 0.25–0.30 times length at widest point; basal and distal fold of costa meeting at 1/3 length of valva; distal fold wrinkled; length of cucullus 1/4 length of valva, longer than wide, somewhat bent towards costa, distinctly twisted over distal fold of costa. Aedeagus gradually tapered towards apex, 0.80–0.95 times length of valva, slightly bent s-shaped, caecum as long as basal opening of aedeagus; vesica with very indistinct straight and narrow cornutus about 0.15–0.22 times length of aedeagus.

**Female genitalia.** Papillae anales rounded, covered with long and thin setae, distally also with short and stout setae. Apophyses posteriores stout, rather straight, length variable to some extent. Apophyses anteriores varying from 2/3 to full length of apophyses posteriores, stout or slender. Ostium bursae occupying over half width between apophyses anteriores, dorsal wall spinose; antrum as broad as deep, internally spinose; ductus bursae posteriorly narrow, tubular, broader cephalad from inception point of

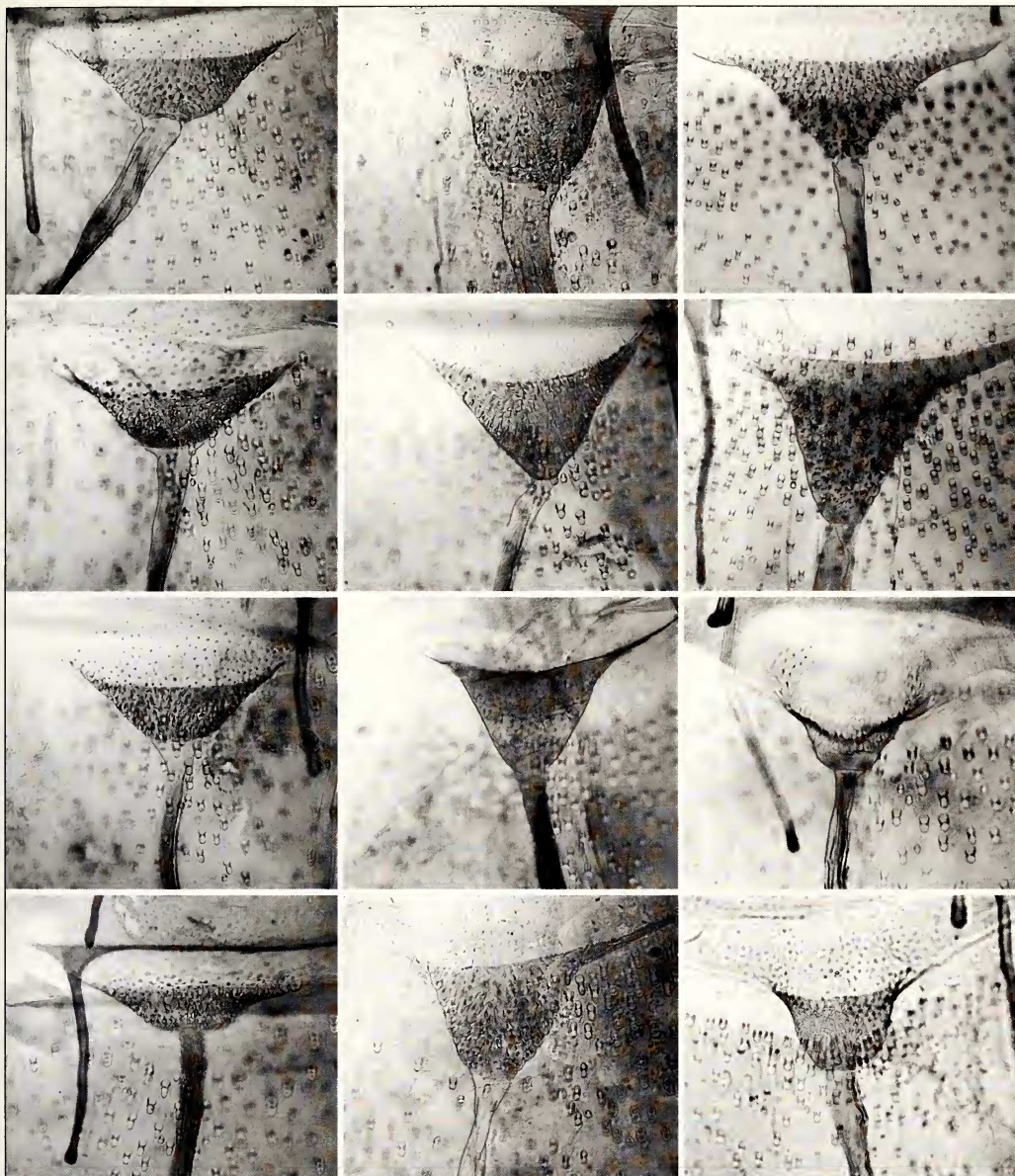




**Fig. 17.** Signum in *Elachista juliensis* and *E. occidentalis*, showing variation found within single populations. Left column: *E. juliensis*, all from ex ovo series: Italy, Piemonte, Chiusa San Michele (TO), Sacra S. Mich., 850 m, A.168 1994, P. G. Varalda leg., slides from top to bottom LK 3881, LK 3882, LK 3883, LK 3884. Right column: *E. occidentalis*, all from Finland Siuntio, Andby, larva ex *Carex digitata* 1991, Kaila leg., slides from top to bottom LK 3199, LK 3760, LK3761, LK3762.

ductus seminalis; sclerotisation of colliculum long, almost extended from antrum to inception of ductus seminalis; ductus bursae distinct from corpus bursae; corpus bursae largely covered with distinctive internal spines; signum an elongate dentate plate of variable shape.

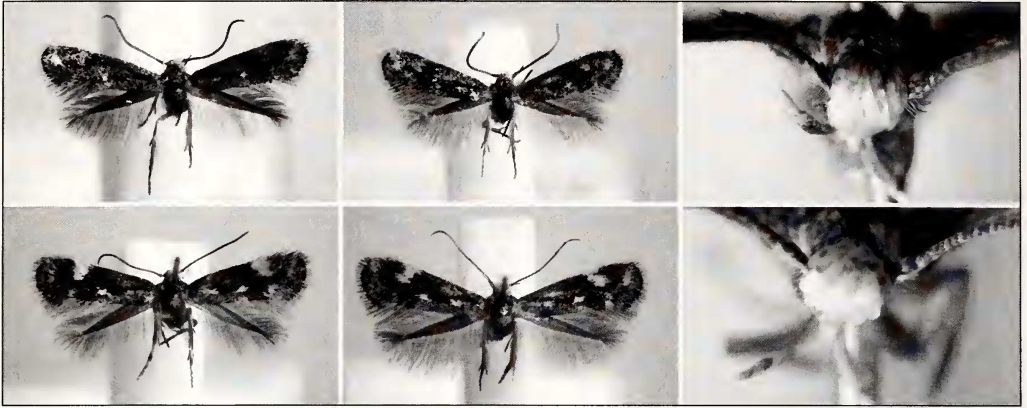
**Life history.** *E. occidentalis* occurs in montane areas in Central and southern Europe. In northern Europe it inhabits xerothermic sites. The adults sometimes have been caught in the evening, and in Central and southern Europe they are attracted to light. The species is univoltine. The larva feeds on *Carex digitata* and *C. ericetorum*. The full-grown larva is 5–7 mm long, greyish green, with the prothoracic and anal plates amber-coloured. The mine is 10–15 cm long, situated either along the mid-rib or the margin of the leaf. The initial mine, constituting about half the total length of the mine, is very thin and then gradually widens. Towards the end it occupies about half the width of the leaf. Pupation takes place in laboratory conditions usually on the mid-rib



**Fig. 18.** Variation in the shape of the antrum in *Elachista juliensis*, *E. occidentalis*, *E. ribentella* and *E. zonulae*. Left column *E. juliensis*, from top: Austria inf. Dürnstein (slide LK 3772), Italy, Dintorni Trento (slide LK 3768), Italy, Piemonte Chiusa San Michele (TO), Sacra S. Mich., 850 m (slide LK 3890), Italy, Piemonte (slide LK 3890). Middle column *E. occidentalis*, from top: Italy Kreuzberg P. Sexten (paratype of *E. ruthae*) slide (ETO B.10.4.93), Finland N: Siuntio (slide LK 3199), ditto (slide LK3760) Sweden, Småland, Marbäck (slide I. Svensson 4651). Right column from top: *E. ribentella* sp. n. paratype, Japan, Hokkaido, Kyōwa-Town (slide Sugisima 0760), ditto (slide Sugisima 0983), *E. zonulae*, Poland, Tatra Mts., Giewont (slide LK 3201), ditto, Russia, Altai, Chuja Valley (slide LK 3907).

of the leaf, sometimes elsewhere, often in a corner of the rearing pot. The pupa is brown, attached to the substrate with a silken girdle.





**Fig. 19.** Habitus of *Elachista ribentella* sp. n. Top row males: holotype (Japan: Hokkaido: Sinsennuma, Kyôwa-Town) paratype ditto, head of the holotype. Bottom row females: 2 paratype ditto.

**Distribution.** Widespread in Europe, material studied from Austria, Bulgaria, Croatia, Estonia, Finland, France, Germany, Greece, Italy, Poland, Sweden, and Switzerland.

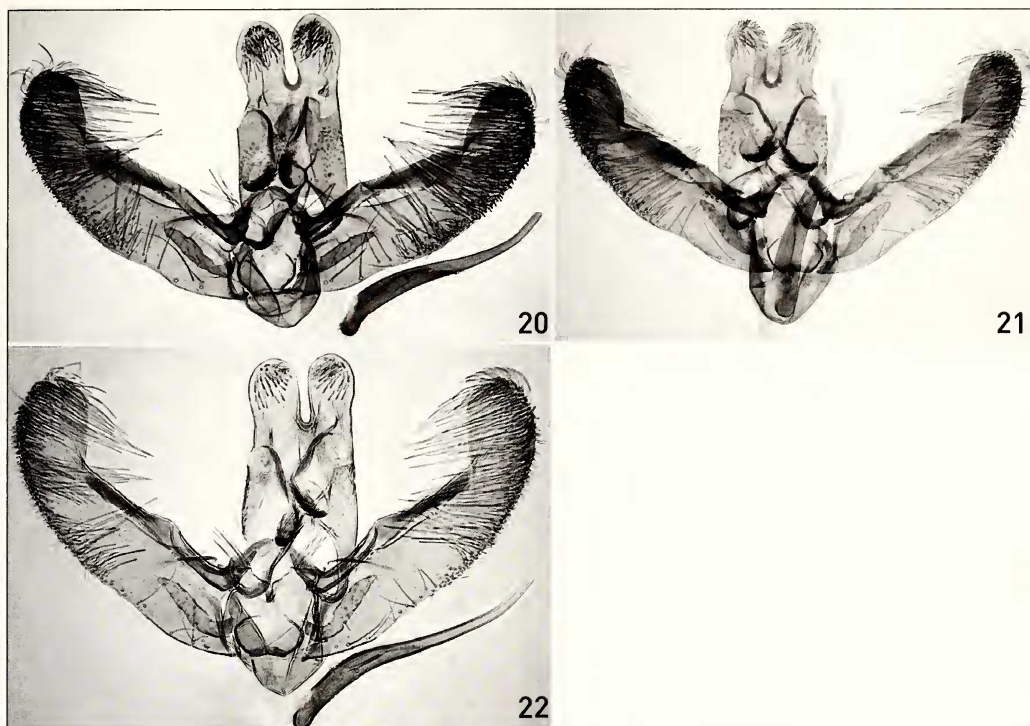
**Remarks.** *E. occidentalis*, as here delimited, is a somewhat variable species, both in colouration and in male genitalia. No obvious trends in any character combination have been detected, and the range of variation in genitalia seems present in populations throughout the distribution range. In central and southern Europe, and in some dry sites also in northern Europe, specimens tend to be paler than those from more northern or humid areas, but variation is great and overlapping everywhere. The holotypes of *Biselachista buvati* Traugott-Olsen, 1994 and *Biselachista ruthae* Traugott-Olsen, 1994 are within the variation observed in *Elachista occidentalis*, and these names are here considered junior synonyms of *Elachista occidentalis*. Note, however, that the male genital illustrations of *Biselachista buvati* in its original description were drawn from a paratype, not the holotype (Figs. 25 and 33 in Traugott-Olsen 1994). They obviously depict *Elachista zonulae* Sruoga (the specimen was not studied). The specimen labelled as the holotype of *B. buvati* (habitus and wing venation illustration in the original description by Traugott-Olsen 1994: figs. 4, 16) is not conspecific with this paratype, and its characteristics, including those of the male genitalia (Fig. 14), fall well within the variation observed in *Elachista occidentalis*. The ♀ habitus aquarel showing *E. occidentalis* in Traugott-Olsen (1994) was painted from an *E. juliensis* specimen (in coll. ZMUC). The valva and the uncus lobes of the holotype of *E. ruthae* appear broader than in other specimens here assigned to *E. occidentalis*. This is due to distortion caused by superfluous squeezing of the genitalia on this slide. Other specimens from the same series from which the holotype of *E. ruthae* was selected, are just like any other representative of *E. occidentalis*.

***Elachista ribentella* sp. n.**

**(Figs. 18–23)**

**Material.** Holotype ♂, labelled: **Japan:** Hokkaido: Sinsen-Marsh, Kyôwa-Town, em. 13.vii.1995 K. Sugisima leg., Host 00118 *Carex blepharicarpa*, ♂ genitalia slide no. 0982 K. Sugisima, 2002. (SEHU).





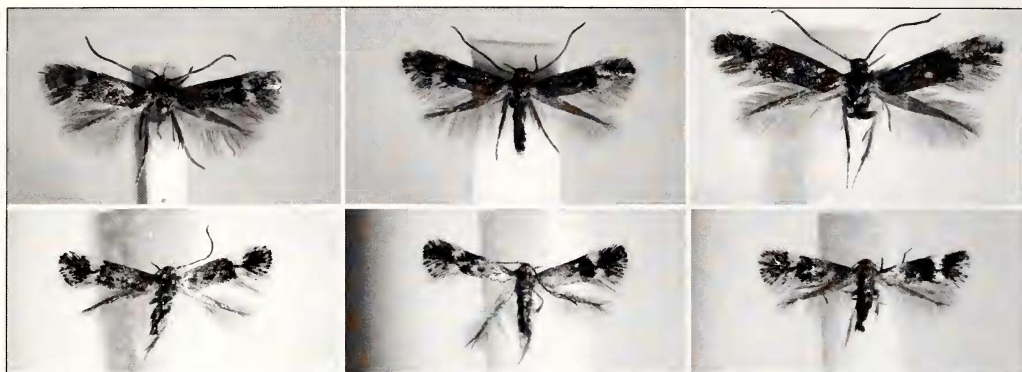
**Figs. 20–22.** ♂ genitalia of *Elachista ribentella* sp. n. **20.** Holotype (Sugisima 0982). **21.** Paratype from Japan (Sugisima 0734). **22.** Paratype from Russia (LK 3749).



Paratypes (11♂, 2♀): 7♂, 2♀ same data, but, e. l. ex *Carex blepharicarpa*, 14.vii.1995, 1., 17., 19.vii.1996, 21.vi.1998, Sugisima leg. (SEHU, 2♂ in MZH); 2♂ Honsyū, Ueno, Azusagawa, Nagano Pref. 13.vii.1982, 22.vii.1982, Hirano leg. (SEHU). **Russia:** 1♂ S. Primorje, 43°16'N 134°04'E, Lazowski Res., 5.–9.viii.1998; 1♂ S. Primorje 43°38'N 132°33'E Ussuriskij Res., 250 m, 29.–31.vii.1998, Jalava, Kullberg & Kaare leg. (MZH). – Additional material: **Russia:** 2♂, S. Primorje, 20 km E Ussurijska, 7.viii.1982, 10.viii.1982, Puplesis leg. (MZH) [specimens in bad condition, glued on cardboard].

**Description.** Forewing length ♂ 2.7–3.5 mm, ♀ 3.5–3.7 mm. Male: Labial palpus ascending, length 1.2–1.3 times diameter of head; above greyish or ochreous white except base of 3rd segment narrowly grey, below powdered with grey in the middle of 2nd and 3rd segment. Head shiny ochreous or greyish white, variably mottled with grey-tipped scales laterally and on vertex. Scape and pedicel of antenna above mottled grey, flagellum thick greyish white below on basal 2/3, above grey, annulated with somewhat paler rings.

**Fig. 23.** ♀ genitalia of *Elachista ribentella* sp. n. paratype (Japan) (Sugisima 0983).



**Fig. 24.** Habitus of *Elachista zonulae*. Top row: males, bottom row females. Top left: Austria, Teriolis Sept., Nordkette, 1500 m, 29.vii.1943, Burmann leg. (TLMF). Top middle: Poland, Tatra Mts. 1350 m, Sarnia Skals 7.vii.1987, Buszko leg. (ZMUC). Top right: Poland, Tatra Mts. Kominiarski Wierch, 1700–1800 m 28.vii.1997, Nupponen & Junnilainen leg. (coll. T. & K. Nupponen). Bottom left and middle: Russia, Altai Mts., Chuja Valley, 1500 m, 5 km SE Aktash 14.vii.2001, Nupponen leg. (coll. T. & K. Nupponen). Bottom right: Russia, Altai Mts., Kuraisky Hrebet, 2300 m, 9.vii.201, Nupponen leg. (coll. T. & K. Nupponen).

Neck tuft mottled grey. Thorax mottled grey, scales of tegula and metascutum whitish, grey-tipped. Forewing ground colour mottled grey, with four indistinct mottled whitish markings: 1 – small streak distally from black streak situated in fold before middle of wing, 2 – triangular costal spot at distal 2/3 of costa, 3 – small, more or less rounded tornal spot beyond costal spot, and 4 – transverse streak at apex; costal spot basally delimited with obliquely oriented, straight black streak and another pronounced streak at fold at 3/4 wing length. Fringe scales grey, basal fringe scales black-tipped forming black fringe line. Hindwing grey. Underside of forewing dark grey, fringe at costal and tornal spots creamy white; underside of hindwing grey. Female as male but forewing ground colour darker grey with brighter and more expanded white pattern, also with small white streak basally delimiting black streak of fold.

**Male genitalia.** Uncus lobes about 1.5 times longer than broad, distally rounded; median incision between them narrow, u-shaped. Mesal margin of juxta lobes short, straight; distal margin somewhat rounded, medially with a group of long scales; digitate process narrow, distally variable, oblique and acute-tipped; length 0.28–0.30 times length of valva; valva somewhat bent, width strongly variable, 0.28–0.31 times length at widest point; basal and distal fold of costa meeting at 1/3 length of valva; distal fold even or somewhat wrinkled, distinctly sclerotised and often remarkably widened distally; length of cucullus 1/4 length of valva, longer than wide, somewhat bent towards costa, distinctly twisted over distal fold of costa. Aedeagus gradually tapered towards apex, length 0.75–0.78 times length of valva, slightly bent s-shaped, caecum as long as basal opening of aedeagus; vesica with straight narrow cornutus, 0.31 times as long as aedeagus.

**Female genitalia.** Papillae anales rounded, covered with long and thin setae, distally also with short and stout setae. Apophyses posteriores stout, rather straight, length variable to some extent. Apophyses anteriores almost as long as apophyses

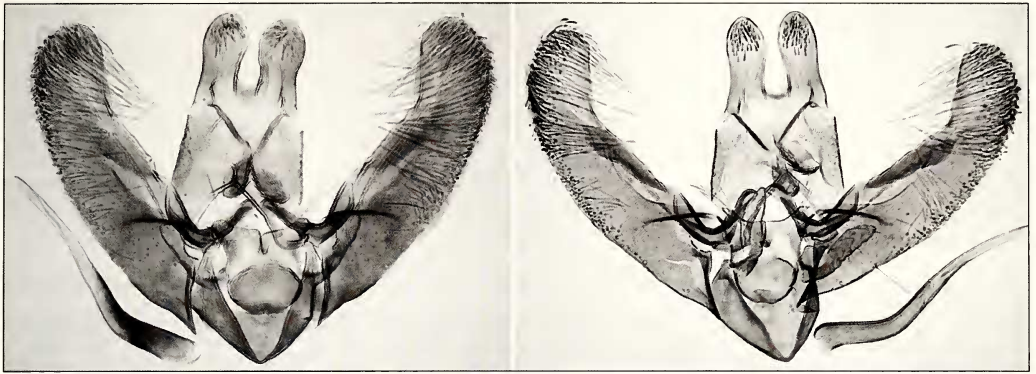


Fig. 25–26. ♂ genitalia of *Elachista zonulae*. 25. *E. zonulae* from France (LK 3758). 26. *E. zonulae* from Russia, Altai (LK 3732).

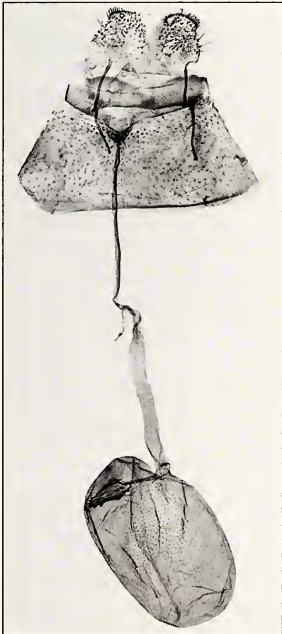


Fig. 27. ♀ genitalia of *Elachista zonulae* (Sruoga) (Poland, Tatra Mts., Giewont, LK 3201).

posteriores, slender. Ostium bursae occupying over half width between apophyses anteriores, dorsal wall spinose; antrum of variable shape, internally strongly spinose; ductus bursae posteriorly narrow, tubular, broader cephalad from inception point of ductus seminalis; sclerotisation of colliculum long, almost extended from antrum to inception of ductus seminalis; ductus bursae distinct from corpus bursae; corpus bursae largely covered with distinctive internal spines; signum an elongate dentate plate of variable shape.

**Life history.** *E. ribentella* has been reared from *Carex blepharicarpa*. The type locality is the wet edge of a peat bog. Specimens from Ueno, Japan have been collected in a moderately humid conifer forest (K. Sugisima, pers. comm.). The specimens from the Russian Far East collected by Jalava, Kullberg, and Kaare were found in a lush meadow and in a ruderal village habitat (J Kullberg., pers. comm.).

**Distribution.** Japan, Russia (Far East).

**Remarks.** The specimens reported as *Biselachista freyi* from the Russian Far East by Sruoga (1995) are referable to *E. ribentella*.

### *Elachista zonulae* (Sruoga, 1992)

(Figs. 18, 24–27)

*Biselachista zonulae* Sruoga in Sruoga & Puplesis 1992: 440

**Material.** **Austria:** 1♂ Teriol. sept. Nordkette, 1400 m, 22.viii.1939, Burmann leg. (LK slide 3858, TLMF); 1♂ same data, but 1500 m, 29.vii.1943, Burmann leg. (LK slide 3857, TLMF), both with identification label “*Elachista juliensis* Frey det. U. Parenti”. **France:** 1♂ Hautes Alpes RN05 5 km W Les Vigneaux, 1250 m, 5.–6.vi.2003, Junnilainen leg. et coll. (LK slide 3758). **Kyrgyzstan:** 2♂ 10 km SE Lake Song Köl, steppe/river bed, 41°30′N 75°35′E, 26.vii.1990, Kaila leg. 3♂, 1♀ 45 km NE Naryn,



2650 m, dry meadow, 41°40'N 76°31'E, 31.vii.1990, Kaila leg. 10♂ 41 km E Naryn, 2850–3300 m, steppe-alpine meadow, 41°20'N 76°26'E, 31.vii.–7.viii.1990, Kaila leg. (all in MZH). **Poland:** 19♂, 1♀ Tatra Mts., Bobrowiec, 1400–1500 m, Mnichy Chocholowskie, 23.vii.1997, Nupponen & Junnilainen leg. (LK slide 3193, coll. Junnilainen, coll. Nupponen, 1♂ in MZH). 3♂ Tatra Mts., Kominiarski Wierch, 1700–1800 m, 28.vii.1997, Nupponen & Junnilainen leg. et coll. (LK slide 3755). 1♀ Tatra Mts., Giewont, Mnich Malolacki, 24.vii.1997, Nupponen & Junnilainen leg. (LK slide 3201, coll. Junnilainen). 1♂ Tatra Mts., Sarnia Skała, 1350 m, 7.vii.1987, Buszko leg. (ZMUC). **Russia:** 4♂, 1♀ Altai Mts., 50°16'–20'N 87°50'–55'E, Kuraisky hrebet, 2300 m, 9.vii.2001, Nupponen leg. 2♂, 2♀ Altai Mts., Chuja valley, 5 km SE Aktash village, 1500 m, 50°14'–16'N 87°40'E, 14.vii.2001, Nupponen leg. (coll. Nupponen, 1♀ in MZH).

**Description.** Forewing length ♂ 2.5–3.5 mm, ♀ 2.4–2.8 mm. Male: Labial palpus ascending, length 1.1–1.2 times diameter of head; above whitish grey except base of 2nd and 3rd segments variably grey, below grey. Head, neck tuft, and thorax mottled grey. Forewing ground colour dark grey, with three greyish white markings: 1 – streak distally from black streak situated at fold before middle of wing, 2 – triangular or rounded costal spot at distal 2/3 costa, 3 – another similar ternal spot opposite costal spot. Fringe scales grey, basal fringe scales darker grey-tipped forming indistinct fringe line. Hindwing grey. Underside of forewing dark grey, fringe at costal and ternal spots creamy white; underside of hindwing grey. Female as male but forewing ground colour darker with brighter and more expanded white pattern.

**Male genitalia.** Uncus lobes about twice longer than broad, distally rounded and slightly broadened; median incision between them almost as broad as basal width of uncus lobes, u-shaped. Mesal margin of juxta lobes short, straight, distal margin somewhat concave, laterally with group of long scales; digitate process blunt-tipped, length 0.22–0.28 times length of valva; valva somewhat bent, width variable, 0.27–0.30 times length at widest point; basal and distal fold of costa meeting at 1/4 length of valva; distal fold even; cucullus 1/4 length of valva, longer than wide, somewhat bent towards costa, weakly twisted over distal fold of costa. Aedeagus gradually tapered towards apex, 0.80–0.95 times as long as valva, strongly bent at basal 1/3, s-shaped, caecum shorter than basal opening of aedeagus; vesica with very indistinct, straight narrow cornutus, about 0.22–25 times length of aedeagus.

**Female genitalia.** Papillae anales rounded, covered with long and thin setae, distally also with short and stout setae. Apophyses posteriores stout, rather straight, length variable to some extent. Apophyses anteriores varying from 2/3 to full length apophyses posteriores, stout or slender. Ostium bursae occupying about 1/3 width between apophyses anteriores, dorsal wall spinose; antrum about as broad as deep, internally strongly spinose; ductus bursae posteriorly narrow, tubular, broader cephalad from inception point of ductus seminalis; sclerotisation of colliculum long, almost extended from antrum to inception of ductus seminalis; ductus bursae inserted distinct from corpus bursae; corpus bursae largely covered with distinctive internal spines; signum an elongate dentate plate of variable shape.

**Life history.** In Central Asia and Siberia *E. zonulae* occurs in high altitude xerothermic meadows. In Poland and the Alps the habitat is similar, although the species has been found in somewhat lower altitudes. Baran (2003), based on Buszko & Baraniak (1989), reports the larva to feed on *Carex sempervirens*. The adult is active in the afternoon and evening before sunset. The species is univoltine.

**Distribution.** Transpalearctic; material examined from Austria, France, Kyrgyzstan, Poland, and Russia (Altai Mts.). Sruoga (1992) reports it also from Kazakhstan and Tajikistan, and Tokár et al. (1999) from Slovakia. *E. zonulae* is recorded from the Alps, Tatra Mts., Tian Shan Mts. in Kazakhstan, and Tajikistan, and Altai Mts. in Siberia.

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#### References

- Albrecht, A. and L. Kaila 1997. Variation of wing venation in Elachistidae (Lepidoptera: Gelechioidea): methodology and implications to systematics. – *Systematic Entomology* 22: 185–198.
- Baran, T. 2003. The second record of *Elachista zonulae* (Sruoga, 1992) (Lepidoptera: Elachistidae) in Europe, with redescription of the species. – *Polskie Pismo Entomologiczne* 72: 131–137.
- Buhl, O., P. Falck, B. Jørgensen, O. Karsholt, K. Larsen, & K. Schnack 1991. Records of Microlepidoptera from Denmark in 1989 (Lepidoptera). – *Entomologiske meddelelser* 59: 29–40.
- Buszko, J. and E. Baraniak (1989). “Studies on the mining Lepidoptera of Poland. vii. Elachistidae of the Tatra National Park.” *Polskie Pismo Entomologiczne* 59: 357–365.
- Frey, H. 1870. Ein Beitrag zur Kenntnis der Microlepidopteren. – *Mitteilungen der Schweizerischen Entomologischen Gesellschaft* 3: 277–296.
- Frey, H. 1882. Zweiter Nachtrag zur Lepidopteren-Fauna der Schweiz. – *Mitteilungen der Schweizerischen Entomologischen Gesellschaft* 6: 349–375.
- Kaila, L. 1992. The Elachistidae of southern Siberia and Central Asia, with descriptions of five new species (Lepidoptera). – *Entomologica Fennica* 3: 177–194.
- Kaila, L. 1996. A revision of the Nearctic *Elachista* s. l. I. The *tetragonella* group (Lepidoptera, Elachistidae). – *Entomologica Scandinavica* 27: 217–238.
- Kaila, L. 1999. Phylogeny and classification of the Elachistidae s.s. (Lepidoptera: Gelechioidea). – *Systematic Entomology* 24: 139–169.
- Liška, J. 1998. Elachistidae. Checklist of Lepidoptera of the Czech and Slovak Republics. – *Z. Lastuvka. Brno, Konvoj*. Pp. 28–30.
- Parenti, U. 1977. Revisione degli Elachistidi (Lepidoptera, Elachistidae) paleartici. IV. Le species di Elachistidi descritte da H. Frey e P. C. Zeller. – *Bollettino del Museo di Zoologia dell’Università di Torino* 3: 19–50.
- Parenti, U. and P. G. Varalda 1994. Gli Elachistidi (Lepidoptera, Elachistidae) e loro piante ospiti. – *Bollettino del Museo Regionale di Scienze Naturali – Torino* 12: 73–136.
- Spuler, A. [1903]–1910. Die Schmetterlinge Europas. 2. Stuttgart. 523 pp.
- Sruoga, V. 1995. Description of *Cosmiotes cornutifera* sp. n. and a provisional check-list of Elachistidae fauna of Far-Eastern Russia (Lepidoptera, Elachistidae). – *Phegea* 23: 157–162.
- Sruoga, V. in: Sruoga, V. A. & R. K. Puplesis 1992. New species of gramineal Elachistid moths (Lepidoptera, Elachistidae) from Middle Asia and Kazakhstan. – *Entomologicheskoe Obozrenie* 71: 428–441.
- Staudinger, O. 1870. Beschreibung neuer Lepidoptera des Europäische Faunengebietes. – *Berliner Entomologische Zeitung* 14: 273–336.
- Tokár, Z., F. Slamka, & G. Pastorális 1999. New and interesting records of Lepidoptera from Slovakia in 1995–1997. – *Entomofauna carpathica* 11: 43–57.
- Traugott-Olsen, E. 1994. Identity of *Biselachista freyi* (Staudinger, 1870) and *Biselachista occidentalis* (Frey, 1882), description of five new species (Lepidoptera, Elachistidae). – *SHILAP Revista de lepidopterologia* 22: 323–348.
- Traugott-Olsen, E. and E. Schmidt Nielsen 1977. The Elachistidae (Lepidoptera) of Fennoscandia and Denmark. *Fauna Entomologica Scandinavica* 6: 1–299. Klampenborg, Denmark.